

**WHAT IS CLAIMED IS:**

1. A toner process comprised of heating a mixture of an acicular magnetite dispersion, a colorant dispersion, a wax dispersion, a first latex containing a crosslinked resin, and a second latex containing a resin free of crosslinking in the presence of a coagulant to provide aggregates, stabilizing the aggregates with a silicate salt dissolved in a base, and further heating said aggregates to provide coalesced toner particles.

2. A process in accordance with **claim 1** wherein silica is incorporated in said toner by an in situ method, and wherein said silica is obtained from said silicate.

3. A process in accordance with **claim 2** wherein said silicate is selected in an amount of from about 0.5 to about 2 percent by weight of toner.

4. A process in accordance with **claim 1** comprising

(i) mixing said acicular magnetite dispersion containing water and an anionic surfactant, and said colorant dispersion containing carbon black, water, and an anionic surfactant, and optionally a nonionic surfactant, and wherein said wax dispersion is comprised of submicron wax particles of from about 0.1 to about 0.5 micron in diameter by volume, and which wax is dispersed in water and contains an anionic surfactant to provide a mixture containing magnetite, colorant, and a wax;

(ii) wherein the resulting mixture is blended with said first and second latex, said first latex comprising submicron noncrosslinked resin particles of about 150 to about 300 nanometers in diameter containing water, an anionic surfactant or a nonionic surfactant, and wherein said second latex comprises submicron crosslinked gel particles of about 30 to about 150 nanometers in diameter, and containing water and an anionic surfactant or a nonionic surfactant;

(iii) wherein the resulting blend of (ii) possesses a pH of about 2.2 to about 2.8, and to which is added a coagulant to initiate flocculation or aggregation of said resulting components;

(iv) heating the resulting mixture of (iii) below about the glass transition temperature ( $T_g$ ) of the resin free of crosslinking to form aggregates;

(v) adding to the formed aggregates a latex comprised of a noncrosslinked resin suspended in an aqueous phase containing an ionic surfactant and water;

(vi) adding to the resulting mixture of (v) an aqueous solution of a silicate salt dissolved in a base to thereby change the pH, which is initially from about 2 to about 2.8, to arrive at a pH of from about 7 to about 7.4 resulting in a coating of silica on the aggregate particles containing magnetite;

(vii) heating the resulting mixture of (vi) above about the  $T_g$  of the noncrosslinked resin of (i) and allowing the pH to decrease;

(viii) retaining the mixture of (vii) at a temperature of from about 85°C to about 95°C for an optional period of about 10 to about 60 minutes, followed by a pH reduction with an acid to arrive at a pH of from about 4.2 to about 4.8, which pH is below about the Pzc of the magnetite particles wherein the Pzc is the pH of the mixture particles when said particles are free of a positive or a negative charge, and optionally wherein an increase in temperature results in a decreased Pzc value;

(ix) retaining the mixture temperature at from about 85°C to about 95°C for an optional period of about 5 to about 10 hours to assist in permitting the fusion or coalescence of the toner aggregates and to obtain smooth particles;

(x) washing the resulting toner slurry;

(xi) isolating the formed toner particles, and drying.

5. A process in accordance with **claim 4** wherein said silicate salt dissolved in said base is introduced at (vi).

6. A process in accordance with **claim 4** wherein said silicate reacts with said magnetite rendering said magnetites substantially insensitive to pH fluctuations and resulting in the magnetite Point of Zero Charge (Pzc) being substantially ineffective

7. A process in accordance with **claim 4** wherein the Pzc of said magnetite is altered by said silica, which silica is present as a coating on said magnetite, and wherein said silica is obtained from said silicate, and wherein said silicate is a sodium silicate, a potassium silicate, or a magnesium silicate sulfate, and said coagulant is a polymetal halide.

8. A process in accordance with **claim 4** (viii) wherein said pH is decreased to about 4.5, said pH being lower than that of said magnetite which is at a pH of about 5.3.

9. A process in accordance with **claim 1** wherein said silicate and said base are respectfully sodium silicate dissolved in sodium hydroxide, or potassium silicate ( $K_2O/SiO_2$ ) dissolved in potassium hydroxide.

10. A process in accordance with **claim 1** wherein said silicate is sodium silicate, thereby forming  $SiO_2:Na_2O$  with a weight ratio of about 1.6 to about 3.2.

11. A process in accordance with **claim 2** wherein from about 75 to about 95 percent of said silica is introduced and retained in the toner surface.

12. A process in accordance with **claim 2** wherein said coagulant is selected from the group consisting of polyaluminum chloride (PAC), polyaluminum sulfosilicate (PASS), aluminum sulfate, zinc sulfate, and magnesium sulfate.

13. A process in accordance with **claim 12** wherein from about 80 to about 90 percent of said coagulant metal ion is retained in said toner.

14. A process in accordance with **claim 1** wherein said colorant is carbon black, and wherein said carbon black dispersion comprises carbon black particles of from about 0.01 to about 0.2 micron diameter dispersed in water and an anionic surfactant, and wherein said colorant is present in an amount of from about 4 to about 10 weight percent.

15. A process in accordance with **claim 1** wherein the amount of acicular magnetite selected is from about 20 to about 40 percent by weight of toner, said colorant is carbon black present in the amount of from about 4 to about 8 percent by weight of toner, and said wax is present in the amount of about 4 to about 12 percent by weight of toner; said crosslinked resin is present in the amount of about 5 to about 10 percent by weight; said uncrosslinked resin is present in an amount of about 55 to about 65 percent by weight of toner; and said coagulant is comprised of polymetal halide present in an amount of about 0.02 to about 2 percent by weight of toner.

16. A process in accordance with **claim 1** wherein said acicular magnetite is from about 0.6 to about 0.1 micron in average volume diameter and is selected in an amount of from about 23 to about 35 percent by weight of toner, and wherein said coagulant is a polymetal halide selected in an amount of about 0.05 to about 0.15 percent by weight of toner.

17. A process in accordance with **claim 1** wherein the acicular magnetite utilized exhibits a coercivity of from about 250 to about 700 Oe.

18. A process in accordance with **claim 1** wherein said acicular magnetite possesses a coercivity of from about 250 to about 500 Oe, a remanent magnetization (Br) of about 23 to about 39 emu/gram, and a saturation magnetization (Bm) of about 70 to about 90 emu/gram.

19. A process in accordance with **claim 1** wherein the toner exhibits a magnetic signal of about 90 to about 150 percent of the nominal where the nominal is a signal strength of about 100 percent.

20. A process in accordance with **claim 1** wherein the crosslinked resin contains resin particles of from about 0.15 to about 0.4 micron in volume average diameter, and said second latex contains a resin free of crosslinking of a diameter of about 0.15 to about 0.4 micron.

21. A process in accordance with **claim 4** wherein said acid is nitric, sulfuric, hydrochloric, citric or acetic acid, and said coagulant is a polyaluminum chloride.

22. A process in accordance with **claim 4 (v)** wherein said noncrosslinked resin is comprised of submicron particles suspended in said aqueous phase containing an anionic surfactant, and wherein said noncrosslinked resin is selected in an amount of from about 10 to about 40 percent by weight of the initial latex (i) to form a shell thereover on said formed aggregates, and which shell is of an optional thickness of about 0.2 to about 0.8 micron, and optionally wherein said coagulant is a polymetal halide.

23. A process in accordance with **claim 4 (v)** wherein said latex contains the same resin as the initial latex of (i), or wherein said added latex contains a substantially dissimilar resin than that of the initial latex.

24. A process in accordance with **claim 4** wherein the pH of the mixture resulting in (vi) is increased from about 2 to about 2.6 to about 7 to about 7.5, and wherein said silicate salt dissolved in a base functions primarily as a stabilizer for the aggregates during coalescence (vii), and no or minimal toner particle size increase results, and wherein said coagulant is a polymetal halide.

25. A process in accordance with **claim 4** wherein the aggregation (iv) temperature is from about 45°C to about 60°C, and wherein the coalescence or fusion temperature of (vii) and (viii) is from about 80°C to about 95°C, and wherein said coagulant is a polyaluminum halide; and optionally, wherein the time of coalescence or fusion is from about 6 to about 12 hours, and wherein the toner resulting possesses a smooth morphology.

26. A process in accordance with **claim 1** wherein said second latex contains a resin selected from the group comprised of poly(styrene-alkyl acrylate), poly(styrene-1,3-diene), poly(styrene-alkyl methacrylate), poly(alkyl methacrylate-alkyl acrylate), poly(alkyl methacrylate-aryl acrylate), poly(aryl methacrylate-alkyl acrylate), poly(alkyl methacrylate), poly(styrene-alkyl acrylate-acrylonitrile), poly(styrene-1,3-diene-acrylonitrile), poly(alkyl acrylate-acrylonitrile), poly(styrene-butadiene), poly(methylstyrene-butadiene), poly(methyl methacrylate-butadiene), poly(ethyl methacrylate-butadiene), poly(propyl methacrylate-butadiene), poly(butyl methacrylate-butadiene), poly(methyl acrylate-butadiene), poly(ethyl acrylate-butadiene), poly(propyl acrylate-butadiene), poly(butyl acrylate-butadiene), poly(styrene-isoprene), poly(methylstyrene-isoprene), poly(methyl methacrylate-isoprene), poly(ethyl methacrylate-isoprene), poly(propyl methacrylate-isoprene), poly(butyl methacrylate-isoprene), poly(methyl acrylate-isoprene), poly(ethyl acrylate-isoprene), poly(propyl acrylate-isoprene), poly(butyl acrylate-isoprene), poly(styrene-propyl acrylate), poly(styrene-butyl acrylate), poly(styrene-butadiene-acrylonitrile), and poly(styrene-butyl acrylate-acrylonitrile).



27. A process in accordance with **claim 1** wherein said second latex contains a resin of a carboxylic acid selected from the group comprised of acrylic acid, methacrylic acid, itaconic acid, beta carboxy ethyl acrylate, fumaric acid, maleic acid, and cinnamic acid, and wherein said carboxylic acid is selected in an amount of from about 0.1 to about 10 weight percent.

28. A process in accordance with **claim 1** wherein said wax dispersion contains a polyethylene wax, a polypropylene wax or mixtures thereof, water, and an anionic surfactant; and wherein said wax is selected in an amount of from about 5 to about 20 weight percent.

29. A process in accordance with **claim 1** wherein said acicular magnetite possesses a coercivity of about 250 to about 700 Oe, a particle size of about 0.6 micron in length x 0.1 micron in diameter, a coercivity of from about 250 to about 500 Oe, a remanent magnetization (Br) of about 23 to about 39 emu/gram, and a saturation magnetization (Bm) of about 70 to about 90 emu/gram; a coercivity of about 345 Oe, a remanent magnetization (Br) of about 35 emu/gram, and a saturation magnetization (Bm) of about 85 emu/gram; a coercivity of about 370 Oe, a remanent magnetization (Br) of about 33 emu/gram, and a saturation magnetization (Bm) of about 83 emu/gram; a magnetite with a coercivity of about 270 Oe, a remanent magnetization (Br) of about 20 emu/gram, and a saturation magnetization (Bm) of about 79 emu/gram; a coercivity of from about 250 to about 400 Oe, a remanent magnetization (Br) of about 23 to about 55 emu/gram, and a saturation magnetization (Bm) of about 70 to about 90 emu/gram; and wherein said acicular magnetite is present in said toner in an amount of from about 10 to about 40 weight percent; or wherein said acicular magnetite possesses a coercivity of about 250 to about 700 Oe, a particle size of about 0.6 micron in length x 0.1 micron in diameter, a magnetite with a coercivity of from about 250 to about 500 Oe, a remanent magnetization (Br) of about 23 to about 39 emu/gram, and a saturation magnetization (Bm) of about 70 to about 90 emu/gram; and wherein said wax is a polyethylene, a polypropylene, or mixtures thereof, and said colorant is carbon black.

30. A process in accordance with **claim 1** wherein said first latex contains a crosslinked resin in an amount of from about 2 to about 25 weight percent; and wherein said crosslinked resin possesses a molecular weight  $M_w$  of from about 100,000 to about 1,000,000, and an onset glass transition ( $T_g$ ) temperature of about 48°C to about 58°C.

31. A process in accordance with **claim 1** wherein said crosslinked resin is poly(styrene butylacrylate, beta carboxy ethyl acrylate divinyl benzene).

32. A process in accordance with **claim 1** wherein said resin free of crosslinking possesses a molecular weight  $M_w$  of about 20,000 to about 500,000, and an onset glass transition ( $T_g$ ) temperature of from about 45°C to about 55°C.

33. A toner process comprised of heating a mixture of an acicular magnetite dispersion, a colorant dispersion, a first latex containing a crosslinked resin, and a second latex containing a resin free of crosslinking, in the presence of a coagulant; adding a silicate salt dissolved in a base, and further heating said aggregates to provide coalesced toner particles.

34. A process comprising heating a mixture of magnetite, colorant, a first latex, and a second latex wherein the first latex contains a crosslinked polymer and the second latex is substantially free of a crosslinked polymer, and which heating is accomplished in the presence of a coagulant and a silicate salt base mixture, and wherein said heating comprises a first and second heating, which second heating is at a higher temperature than said first heating, and wherein said first heating is below about the glass transition temperature  $T_g$  of said resin free of crosslinking, and said second heating is above about the  $T_g$  of said resin free of crosslinking.